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BTEC

Mark Scheme (Results)

June 2022

Pearson BTEC Nationals
In Applied Science (31627H)
Unit 5: Principles and Applications of Science II - Biology

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Unit 5: Principles and Applications of Science II

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The marking grids have been designed to assess learner work holistically. Rows in the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band, depending on how they have evidenced each of the descriptor bullet points.

BTEC Next Generation Mark Scheme

Question Number	Answer	Additional Guidance	Mark
1 (a)	B – Proximal convoluted tubule		1
1 (b)	(descending) loop of Henle	*accept* answer on Figure 1 *accept* loop of henle *accept* phonetic spelling e.g. henly/Henly/Henley /henli *ignore* 'ascending'	1
1 (c)	Any one from: • Osmoregulation / salt water balance / maintain blood water level • acid-base balance / maintain blood pH (neutral/7.4) • electrolyte balance • reabsorption of water / reabsorption of ions • blood pressure regulation	*Allow:* production/secretion of {EPO/oestrogen} *Do not credit:* secretion of adrenaline	1

1 (d)	*Three from*: • down {concentration/water potential} gradient (1) • by {osmosis/diffusion} (1) • through {channels/aquaporins (1) • (under influence of) ADH (1) • (which causes) permeability of (collecting duct) walls (to water)(1)	*accept* from high to low concentration *accept* ADH from pituitary/hypothalamus	3
1 (e)(i)	division (1) 20 ÷ 0.33 evaluation (1) 60.6/61	ECF for one mark maximum correct response and no working = 2 marks *do not credit* subtraction *allow* multiplication for max 1 ecf *allow* any number that rounds up to 61	2
1 (e)(ii)	(molecules) too large (to be filtered/pass though basement membrane/through glomerulus) (1)	*ignore* 'because protein is needed) *do not credit* 'has been reabsorbed'	1
		Total	9 marks

Question Number	Answer	Additional Guidance	Mark
2 (a)	B – Endocytosis		1
2 (b)	*Any of the following can be identification or expansion points, depending on how the learner shapes their response.* Three from: • (mitochondria) {produce/provide/supply} ATP (1) • by (aerobic) respiration (1) • because (phagocytosis/engulfing/ingesting/ endocytosis) {is active/needs energy}(1) • another valid point (1)	*accept* 'energy' for ATP *do not credit* anaerobic respiration *accept* 'energy needed to make enzymes for digesting/killing pathogens *accept* energy for phagocytes to move to where pathogens are (in lungs)	3
2 (c)	reduces (surface) area/ SA (1) (so) less (diffusion/gaseous exchange) (1)	*do not credit* 'no gas exchange'	2
		Total	6 marks

Question Number	Answer	Additional Guidance	Mark
3 (a)(i)	A – ☆		1
3 (a)(ii)	{AV/atrioventricular/bicuspid/ mitral} (valve) (1)	*do not credit* references to right valve i*gnore* heart strings *do not credit* 'valve'alone	1
3 (b)	F = contracts / beats / pumps / pulses (1) G = nerves / nerve impulses / nervous system / nerve signals / brain (1)	accept answer in sentence 1 box *ignore* 'functions' *ignore* 'relaxes' *accept* neurones/nerve cells *do not accept* 'electrical impulses' as heart muscle and specialised muscle fibres e.g. Purkyne fibres, and specialised muscle cells e.g.SAN, AVN, use these	2
3 (c)(i)	carry / provide / take /supply {oxygen/oxygenated blood} (1) to heart {muscle / heart wall / wall of {ventricles/atria}/myocardium} (1)	*accept* glucose/lipids/nutrients *accept* 'cardiac muscle' *Do not credit* 'heart' alone or 'heart tissue/heart cells' alone	2

3 (c)(ii)	*Award one mark for an identification point and one mark for an expansion point. Any of the following can be identification or expansion, depending on how the learner shapes their response.* *Any **two pairs of** linked points from*: • compatible / genetically identical / not foreign / has self antigens / same blood group (1) • (so) no (risk of) rejection (1) • (so) less risk of failure / less likely to need another operation (1) • (so) no need for {immunosuppressants / drugs to prevent rejection} (1) • (so) immune system will not be {weakened/compromised}/less risk of infections (1) • (so) less risk of cancer (1) • quicker/no need to wait (1) • shortage of donors / donors need to be matched / donors need to be of same blood group/tissue type) (1) • <u>only</u> the patient has {risk/discomforts/recovery} associated with surgery (to obtain vein tissue) (1)	Accept converse arguments (ORA) throughout *accept* not being attacked by WBC/immune system/antibodies/T cells/B cellsl *allow* immunodepressants This can be in context of infection transmitted via the transplant e.g. 'transplant could be contaminated'	4

	accept any other valid response		
		Total	10 marks

Question Number	Answer	Additional Guidance	Mark
4 (a)	D		1
4 (b)	*Award one mark for an identification point and one mark for an expansion point. Any of the following can be identification or expansion depending on how the learner shapes their response.* two from: (E is) residual air / residual volume / air left in lungs (after exhaling/before inhaling) (1) stops lungs collapsing / prevents alveoli sticking together / keeps alveoli open (1) (which would/so does not) reduce gaseous exchange / allows continuous gas exchange / allows gas exchange between breaths (1) (so do not) need too much energy to (overcome resistance and) re-open alveoli (1)	 *accept* air that is always there / lungs never emptied *accept* promotes {lung/alveolar} patency *accept* to promote gas exchange *accept* would be difficult to open up alveoli after they had stuck together	2
4 (c)	reading from graph (1) no of breaths in defined period, e.g. 1 in 5s or 2 in 10 s or 4 in 20 s substitution (1) (no of breaths ÷ interval) x 60 evaluation (1) 12 (breaths per minute)	correct response with or without working gains 3 marks ECF to max 2 allow 2 x 6 or 4 x 3 or 1 x 12 or 60 ÷ 5 (allow 60 ÷ time interval) x number of breaths	3

4 (d)	M tidal volume (1) N bronchi/bronchus (1) O surfactant (1)	accept answers in Paragraph 1 *not* bronchiole/bronchole/broncholous *allow phonetic spellings e.g. bronches*	3
		Total	9 marks

Question number	Indicative content
5	*Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers*. *COPD:* • Credit a reference to what COPD is *Peak flow:* • Use peak flow meter/description • Description of how to use • measures how fast you can blow air out of lungs (in L/minute) • take best of three readings • to find (max) speed of expiration • measures ability to breathe out air • role of health care professional(s) in using results • and monitor degree of obstruction in airways • can help diagnose {asthma/if airways are narrowed} • can indicate emphysema • can show severity of asthma/emphysema/COPD • can monitor if condition is improving/getting worse • easy to obtain and use/can take home so patient can monitor themselves daily • can compare morning and evening readings • compare to {chart/nomogram/normal readings} for {height/gender/age}/PEFR varies with age, gender and fitness levels • can inform when to use {bronchodilator/inhaler} • can keep a diary and be reviewed with {GP/nurse}

Mark scheme (award up to 6 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.		
Level	**Mark**	**Descriptor**
Level 0	0	No rewardable material.
Level 1	1–2	• Demonstrates adequate knowledge of scientific facts/concepts with generalised comments made. • Generic statements may be presented rather than linkages being made so that lines of reasoning are unsupported or partially supported. • The discussion shows some structure and coherence.
Level	**Mark**	**Descriptor**
Level 2	3–4	• Demonstrates good knowledge and understanding by selecting and applying some relevant scientific knowledge facts/concepts to provide the discussion being presented. • Lines of argument mostly supported through the application of relevant evidence. • The discussion shows a structure which is mostly clear, coherent and logical.
Level 3	5–6	• Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of scientific facts/concepts to provide the discussion being presented. • Line(s) of argument consistently supported throughout by sustained application of relevant evidence. • The discussion shows a well-developed structure which is clear, coherent and logical.

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